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## EVERYWHERE AND NOWHERE

*Liana Christensen*

In 1788 Europeans arrived here to stay. Since then, between eighteen and twenty mammal species have been lost, depending on who's counting. Gone, too, are the Paradise Parrot and the Dwarf Emu. Alarming high numbers of animal (and plant) species hover just this side of oblivion. Not infrequently in Australia's natural history the first sighting of an animal by a colonial collector is followed fairly swiftly by a long disappearance. Very few come back. For the most part, expanding populations of exotic predators and feral competitors, combined with shrinking islands of natural habitats mean that the average Australian has few chances to experience firsthand even the commonest creatures of this continent. These days, the closest many people come to direct contact with an indigenous mammal is via the roo bars on their oversized four-wheel-drive vehicles. I suspect that the repercussions of this loss are greater than we can imagine.

Against this background of general absence, any readily available undomesticated animal species tends to end up carrying the burden of our unconscious longing for all the wild animals that are now extinct. Western Australia has two such public service animals: the dolphins of Monkey Mia in the Shark Bay World Heritage Area and the Quokkas of Rottnest Island. People from other places flock to see them — with mixed consequences. The obvious danger is that the animal is reduced to nothing more than the curious inhabitant of an increasingly degraded, look-ma-no-fences, outdoor zoo. In this context, islands can be both more and less accessible than the rest of the continent.

A prime example of the least accessible is Barrow Island, an oil-drilling concession of Western Australian Petroleum (WAPET). It shelters, by all accounts, a wonderland of animal species rare, endangered or extinct on the mainland. To visit Barrow Island is to be granted the privilege of time travel to the recent and richer past. A prime example of the most accessible kind of island is Rottnest, 12 km off the coast of Fremantle. Five thousand years ago - when the sea level rise peaked at 2.4 metres - the singular island we call Rottnest was a mini-archipelago of ten. Fifteen hundred years before that, it was not an island at all. Although the formation of Rottnest Island was relatively recent in geological terms, there has been time enough for one or two animal species, the Shingleback (*Tiliqua rugosa konowi*) and the Dugite (*Pseudonaja affinis exilis*) to evolve sufficiently distinguishing characteristics to be considered sub-species. If they survive, island animals often grow a little different.

Despite this, some locals feel that the rather sparse animal species of Rottnest are nothing special. It is a commonplace that anything acquires glamour in direct proportion to its rarity and inaccessibility. Thus the Quokka that allures the visitor from afar dulls to the ordinary for many Perth dwellers. It takes more effort for a local to remember that encounters with the quotidian Quokkas of Rottnest are also a gift. Most people believe that the Quokka - a small, short-tailed wallaby - is unique to Rottnest Island. Well into this century, however, they were common all along the south-west coast. But their relatively recent presence (up until the 1930s at least) in Margaret River, in Yarloop, north of Bunbury, in Cape Naturaliste would seem to most people as tall a tale as that of a recent sighting of the Tasmanian Tiger. Change is swift, but not swifter than our collective ability to forget. Quokkas are now restricted to Rottnest and Bald Islands, and some of the more densely forested parts of the south-west mainland. Your chances of seeing a Quokka in the south-west forests, though, would run close to zero, whereas on Rottnest they are everywhere.

*Quokkas were everywhere* in 1696 when Willem de Vlamingh became the second Dutch mariner to record a sighting of this small island off the south-west coast of *Novae Hollandiae*. Somewhat surprisingly, given that he thought it was swarming with rats the size of cats, Vlamingh's response to the place was far warmer than that of his precursor, Samuel Volckertsoon, who visited in 1658. Volckertsoon's earlier visit meant that the Quokka is recorded as the second marsupial to be officially observed by Europeans (it was hard to miss the uncryptic kangaroos and tammar wallabies), although its status as a marsupial wasn't established until French taxonomists Quoy and Gaimard described it in 1830, nearly two hundred years later. The type specimen is in a Paris museum. Volckertsoon thought the Quokka was like an Asian civet cat (Strahan 401), and dismissed the island itself as useless. Presumably that meant useless for the purposes of empire. Vlamingh named it *Rottenest* - Dutch for Rat's Nest - and found it paradisiacal. It might sound strange to some, but perhaps months at sea had so tempered Vlamingh's outlook that any earth, even earth adorned by a few thousand over-sized rodents, seemed like heaven.

Having quickly shaken off the misapplied name of rat, what we now know as the Quokka was referred to by the more general term wallaby (sometimes Short-tailed Wallaby or Short-tailed Pademelon) throughout the early colonial years. It wasn't until the 1940s that the name Quokka came into common currency. It was derived from *Quak-a*, the noun used by Aboriginal people of the south coast for the same species. If the local people of the Swan coastal plain had visited *Wadjemup* prior to the colonial era they would have recognised its chief resident as *Bungenup*, or *Bangup*. It seems a little odd. If you adopt an indigenous word, why not choose the local version rather than borrow from further afield? Zoologist Chris Dickman offers an explanation (not a *justification*) for Europeans' indiscriminate application of southern indigenous names to the same animals found elsewhere in Western Australia: "Perhaps it simply reflects that much of the collecting work by naturalists such as John Gould and John Gilbert last century was carried out in the Albany area." (NP)

This suggestion makes sense because it wasn't until the 1940s that Quokka research began - and it would be researchers rather than the general public who would be more likely to know of, and use, indigenous names recorded by Gould and Gilbert.

*Quokkas were everywhere* in May 1948 when Professor Harry Waring of the University of Western Australia's Zoology Department visited the island and was among the first to recognise the research potential of the Quokka population. At that time, no research had been done on Australian marsupials for more than 40 years, and Quokkas were scientifically *carte blanche* - a state that changed rapidly. Accessibility and lack of natural predators made the Quokka an ideal subject, and, according to Strahan (401), the foundation knowledge of macropod nutrition, temperature regulation, reproduction, immunology, ecology and behaviour comes from studies of the Rottnest Quokka. As Quokkas suffer from a type of muscular dystrophy caused by lack of vitamin E, their disease has also been used as a model for medical research into muscular dystrophy in humans - which has a different aetiology, but a similar pattern of development.

*Quokkas were everywhere* in 1951-2 when the late Emeritus Professor Bert Main began the first of many studies of them. It was at the beginning of a lifetime's research into Western Australian animals, their adaptations to aridity and therefore the history of their ecosystems. But the young scientist had already lived through several lifetimes of experience in the preceding decade. Main had left school at fifteen. Like most youngsters during the Depression years, he could not afford the luxury of staying longer. After an unenthusiastic stint in the public service, he gave war service in both the Army and the Airforce. During the last months of World War Two, the plane in which Main was a navigator was shot down. He was taken prisoner. As Germany's defeat loomed, he and fellow prisoners were taken from Stalagluft 7A, Nuremburg, and marched down along the Danube through Bavaria. At the beginning of his imprisonment he weighed 80 kg. By the time he arrived at Landschut he weighed 43 kg. Physical recovery was complete, albeit slow. Yet in more subtle ways Main was permanently changed by his war experiences.

Main's hunger for knowledge may well have been fuelled by the intellectual and physical deprivations he experienced during his time as a prisoner of war in Germany. He, himself, says that physical hunger certainly taught him the importance of nutrition, which was to become a major focus of his research. After repatriation, he had gone to night school in Perth and matriculated in 1946. Bright and ambitious, he took a degree at the University of Western Australia, with a double major in geology and zoology. After studying on a Fulbright Scholarship at Chicago University, and at Oxford, Main returned to join Waring, his former supervisor, as a colleague. They were founding members of a new generation of zoologists, people who wanted to know more about what was closer to home than what was considered important overseas.

*Quokkas were everywhere* to a degree so troublesome that a special meeting was held by the Rottnest Island Board in 1960. Main was called in to give an account of the Quokkas' biology as it pertained to the problem. But, what was the problem? Quokkas were an issue in that they are such efficient saboteurs of any attempts at revegetating the island. In some curious throwback to their tenuous connection with rats, they had attracted the attention of the vermin control board. They were seen by some as a potential menace to public health. Here we have the Quokka quandary part one: zoonosis. This might sound like close communion with animal spirits, but it actually means animal organisms that can cause disease in humans.

In the case of Quokkas, as well as the ubiquitous Silver Gulls, the organism in question is *Salmonella*. And what a host they have in Quokkas. Ninety-two different serotypes of *Salmonella* have been found in Rottnest Quokkas, and infection rates peak in mid-summer, as do the numbers of human visitors to the island. It is not as ominous as it sounds. For a start, the Quokkas aren't 'diseased animals'. They co-exist quite happily with the 92 serotypes, just as humans do with large numbers of their own commensal bacteria. More to the point, only a handful of the *Salmonella* serotypes found in Quokkas are capable of infecting humans. Apart from increasing chlorination of the water supplies and recommending people don't touch the Quokkas (a good general principle, for many reasons) the authorities don't see the need for stringent measures. According to the Rottnest Island Museum, the only confirmed case of a human catching *Salmonella* from a Quokka was also the only confirmed case of a human eating Quokka dung. Now that's carrying communion with animal spirits a bit too far!

*Dead Quokkas were everywhere in the summer of 1962-63* and the ensuing outcry attracted the attention of both Ludwig Glauert, then Director of the Western Australian Museum and Dr Dominic Serventy, a member of Western Australia's well known family of naturalists (Joske, Jeffery and Hoffman 388). Some decades earlier Glauert had voiced a concern that Rottnest Island residents were sending wallaby (Quokka) skin rugs to the mainland, and such activities might result in the species' demise. By 1963 the animals' robust persistence caused him to be more sanguine about their fate, and he did not consider the number of Quokkas dead of natural causes to be particularly high. Serventy respectfully differed, and maintained a high level of concern for their ongoing wellbeing. He was also a persistent opponent of culling the species. There were many advocates of this method of controlling their assaults on revegetation, and their nuisance value in the settled areas of the Island. Serventy favoured preventative measures: fences to keep the Quokkas out of revegetation and out of trouble with local businesses, and education of tourists to reduce the incidence of cruelty to the animals.

It is hard to imagine just what kind of education would serve to reach the type of man-the-hunter mentality that amuses itself by spearfishing Quokkas or playing 'Quokka football' - both activities that reappear on a dismally regular basis.



Successfully negotiating with such mentalities won't be easy, but we should not lose faith in the process of change wrought by education, no matter how slow. After all, it wasn't until a decade or so after Rottnest was gazetted as an A-class Nature Reserve in 1917 that the socially acceptable sport of Quokka shooting was banned. Now it would be unthinkable. Sometimes things do improve (even if, in moments of private despair, I am tempted to agree with Bert Main's contention that things may appear to change, but they are merely moving in thirty year cycles!).

*Quokkas were everywhere* in 1968 when my family first visited Rottnest. As far as we were concerned, communing with animals is one of life's great pleasures. Thus, close encounters with Quokkas were just about the crowning adornment of what my family, like Vlamingh, considered heaven on earth. In this we were hardly uncommon. As far as I was concerned the Dugites (*Pseudonaja affinis exilis*), although in theory a little more scary, were equally delightful. Evidently a less popular opinion. For reasons that seem obscure to me, it never featured in the tourist glossies - *Come to Rottnest to see the snakes*. Being Elapids, the Dugites are, of course, venomous. So by all means treat them (and other snakes) with a healthy respect. Yet they are, for the most part, beautiful, unaggressive, retiring creatures. The Dugites of Rottnest are often a little smaller than their mainland counterparts, but when we first went there, they appeared far more numerous.

I can't remember the last time I saw a Dugite on the Island. Did they suffer a natural decline in response to increasing population pressure of humans? (Visitor numbers have gone from 22 000 in 1914 to around 500 000 in 2010.) Have they simply retired out of sight permanently, fed up with constant traffic on tracks where in the past they could bask in peace? Was their retreat passively encouraged on behalf of public safety? Were they actively persecuted like the Carpet Snakes of neighbouring Garden Island? Given that snakes - like wolves, like rats - still bear the heavy burden of our fearful ambivalence, I'm afraid this is all too likely. Is it possible that their absence is simply part of a long term, but normal, rise and fall in population? Is snake nostalgia part of the gradual onset of oldtimers' syndrome? Does anybody else miss the snakes?

The snakes are no longer everywhere, but the Quokkas remain. To understand the Quokka in relation to its environment is to understand some of the more important principles of island ecology. Islands can offer protection from exotic predators. Rottnest is fox-free and its feral cat population is low and manageable, especially since domestic cats were banned from the island in 1979. Even in ideal conditions, however, small islands are seldom species-rich, and their fauna is frequently free of competitors - not an unmixed blessing. Apart from visiting Sea Lions (and humans, of course), the Quokka is the sole mammal on Rottnest, just as the Dugite is the sole snake. (Public literature about neighbouring Garden Island always touts the Tammar Wallaby, *Macropus eugenii*, and the Tiger Snake, *Notechis scutatus*, like it was a competition between rival country towns displaying the very best of their

sparse offerings. In fact, the south-western sub-species of the Carpet Python (*Morelia spilota imbricata*) also lives on Garden Island, and being less of a threat than the highly venomous Tiger Snake, has suffered doubly from the attention of bullies who seem to find snake bashing a great release of tension. Rottnest with Dugites, Garden Island with Carpet Snakes and nearby Carnac Island with Tiger Snakes - a series of prototype Edens abandoned to earthly ills!

The Quokka is generally judged to have been free of natural predators on Rottnest Island. It's a mistaken assumption. Although there are no mammalian predators native to Rottnest, Sea Eagles - which were part of the island's fauna until early this century - almost certainly included Quokkas in their diet. Sea Eagles (*Heliastur leucogaster* - the same species as the Bald Eagle) have frequently been observed preying on the larger tammars of the Abrolhos Archipelago. Perhaps people found such non-mammalian predation offensive. At any rate, hunters shot so many Sea Eagles that for several decades they were locally extinct. Another fact that's often overlooked is that the female Carpet Python of Garden Island is quite capable of eating a Tammar and mainland Tiger Snakes have been known to swallow adult Bandicoots, so it is only by a quirk of time - Garden Island was connected to the mainland far more recently - that the Rottnest Island Quokka was not a snack for snakes. In the end, however, the Quokka found itself free of the restraints of natural predators.

And anybody with an elementary grasp of ecological principles could guess the outcome of such single-species dominance common on small islands. If nothing eats you, and nothing eats your food, your species will expand to fill all the available niches, consuming all the available food until a balance is reached or extinction follows. If something disturbs that balance, whole vegetation systems can be stripped. From the point of view of vegetation, the 'gentle' herbivore looks every bit as ravening as the carnivore. Half a century and half a world away, Aldo Leopold wrote it best:

Since then I have lived to see state after state extirpate its wolves. I have watched the face of many a newly wolfless mountain, and seen the south-facing slopes wrinkle with a maze of new deer trails. I have seen every edible bush and seedling browsed, first to anaemic desuetude, and then to death. I have seen every edible tree defoliated to the height of a saddlehorn. [...] In the end the starved bones of the hoped-for deer herd, dead of its own too-much, bleach with the bones of the dead sage, or molder under the high-lined junipers.

I now suspect that just as a deer herd lives in mortal fear of its wolves, so does a mountain live in mortal fear of its deer. And perhaps with better cause, for while a buck pulled down by wolves can be replaced in two or three years, a range pulled down by too many deer may fail of replacement in as many decades (139-140).

This destructive capacity of herbivores in an unbalanced ecosystem is the underlying reason for the larger part of the Quokka quandary. Following human disturbance of the ecosystem, Quokkas are quite capable of eating themselves out of house and home. When Vlamingh named Rottnest, the island was not just populous with Quokkas, it was thick with trees as well. Granted, there were far fewer species than had existed there before the island was formed. Still, more than 65% of the surface was covered in tall woodland, including wattle (*Acacia rostellifera*), tea tree (*Melaleuca pubescens*) and Rottnest Island Pine (*Callitris preissii*). Today, less than 5% of the island has its original vegetation, supplemented by another 6% of reafforested land (Playford 5).

Over the centuries since the Island was calved from the mainland, the Quokka had reached a cordial *détente* with the tasty trees. Enter humans, however, and by the beginning of the nineteenth century the indigenous ecological dynamic was disrupted in multiple ways. Frequent bushfires, land clearing, firewood collection for private use and also for boiling the salt pans left tracts of land treeless. Revegetation proved difficult. Its frontline enemies were poor soils, erosion and burning. Rottnest was seldom burnt before the arrival of humans on the island, and its vegetation - unlike many Australian species - is poorly adapted to fire. And hard on the heels of earth, wind and fire come the hungry Quokkas. The Quokkas, for whom virtually any vegetation is edible (bar the seriously poisonous oleander), make short work of the tender regrowth.

Remarkably, during an era that favoured wholesale clearing, reforestation was proposed for Rottnest as early as 1883 by, of all things, the Commission of Inquiry into Rottnest Prison. Most likely, the authorities were prompted more by the practical requirements of the colony than any sophisticated understanding of the ecosystem they had disrupted. Whatever their motivations, in 1886 Governor Broome put up 50 pounds for a pine plantation. All 11 000 of the pine trees planted died. So, for a while, did the idea of reforestation. It was resurrected in 1905 by the Colonial Secretary. Different exotic species were planted, but they, too, died in their hundreds. It wasn't until 1929 that some headway was made. This was largely owing to the skills of newly-appointed member of the Rottnest Island Board, Dr William Sommerville, who was the first person to systematically tackle the problem. Sommerville was a man with knowledge of trees. Few people these days would remember the Sommerville Pine Plantation that is now the site of the housing estate of Winthrop. His name lives on, however, in the tree-defined Sommerville Auditorium, of the University of Western Australia, beloved outdoor venue for Festival of Perth events.

Under Sommerville's direction, the graceful native Tuart (*Eucalyptus gomphocephala*) was judged a highly suitable species for revegetating Rottnest. Although it would not be considered environmentally kosher by today's standards, Sommerville's decision showed great insight into local ecosystems. In the public imagination the only Tuart



forest is the Ludlow Tuart Forest, a thin, fifty kilometre strip of coast from Bunbury south to Busselton. In fact, its distribution is scattered here and there beyond those narrow boundaries, but it is still comparatively rare. In more geologically recent times aridity has made the Tuart, strictly speaking, an exotic on Rottnest, but it could pass as a native. Recent fossil pollen tests underscored the finesse of Sommerville's decision by revealing that until about 7 000 years ago Tuart did grow on the land that later became Rottnest Island. It is a tree superbly adapted to coastal conditions, but with the expansion of farmlands and towns, its own natural occurrence - never extensive - has now shrunk.

Generations of Rottnest campers have good reason to be grateful to Sommerville and to the Italian prisoners of war whose labour made a substantial contribution to the planting program in 1942. It's a moot point, though, how many of the adolescent imbibers at Tentland would recognise as Tuarts the trees that shade their mornings-after. The equally nocturnal Quokkas are also beneficiaries of the many revegetation programs that have been carried out since Sommerville's time. If seedlings are protected through their early years, in time they will offer shelter to Quokkas, which like to spend their days resting under low, dense vegetation, such as wattles and tea trees.

For a species that prefers cool, densely wooded, well-watered country, the Quokka has done well on this semi-arid, scrubby island. This is largely owing to the peculiarities of its digestive and excretory organs. The species has done so well, in fact, that Bert Main was able to use it as a model of adaptations to seasonal drought. Quokkas can live for periods of time without fresh water, getting by on the water content of succulent plants, especially pig face (*Carpobrotus virescens*), an introduced species from South Africa. They also have exquisitely designed kidneys that allow them to occasionally drink seawater with no ill-effects. Like sheep, they are ruminants, although they do not possess the classical four-chambered ruminant stomach. The efficiency of a Quokka's digestion is mid-way between that of domestic ruminants and that of other non-ruminant herbivores. When it comes to survival, however, they put sheep to shame. Groups of Quokkas will eat whatever is to hand, however poor a source of nutrition, and predictably don't have the energy to move far in search of something else. Left to their own devices, some populations live on succulents alone, some on protein. Incredibly, for long stretches of time, some of them live on water and not much else. As if to console themselves for this culinary scarcity, they are, within the confines of their guts, closet drinkers. The hidden appeal of the coarse bark they often subsist on is the sugar content which ferments to alcohol during digestion. (This ability would be envied by adolescents who have to pay for the alcohol that fuels the traditional Rottnest end-of-school parties.) It is a two-stage process. The alcohol feeds bacteria in the gut, and the bacterial protein feeds the Quokka.

As most of the plants that Quokkas eat grow in winter, the water and nitrogen content of their food falls dramatically in summer. The succulents they then use to supplement or replace their water intake are particularly low in nitrogen. Quokkas are thus frequently protein-deficient and chronically anaemic, and many individuals die by early autumn - hence the recurring problem of dead Quokkas. Cobalt, copper and molybdenum are deficient in Rottnest soils, and the lack of copper probably restricts their breeding to once a year, unlike mainland Quokkas, which reproduce throughout the year. Despite these difficulties, the population as a whole seems to suffer few ill effects, from either the gut alcohol or the severely unbalanced, starvation-style diet. It is the settlement populations living on the overly-rich diet of scavengers that become subject to the ills of affluence.

When I first went to Rottnest feeding bread to the Quokkas was considered *de rigueur*, as traditional and harmless a family amusement as tossing your leftover chips to the seagulls. Putting such scraps in the bin would have seemed mean. Today, for reasons that appear obvious now, such activities are severely frowned upon, although you still see the odd tourist give in to the temptation. These lapses are no great cause for dismay. On the contrary, given that Quokkas are world-class winsome scroungers, it's a tribute to the effectiveness of public education that so many people now refrain.

This eat-anything, half-ruminant marsupial herbivore is in a class of its own in more ways than one, a fact reflected in its sole occupation of the genus *Setonix*. It may look fairly similar to other small wallabies, apart from its short tail, but less obvious structures of teeth, skull and blood proteins mark it out as something quite distinct. In an evolutionary sense it went its own way a long time ago; its forebears would have been an earlier, undifferentiated group of browsing macropods. Some scientists place the Quokka's closest living relatives as the tree kangaroos and forest-dwelling wallabies of eastern Australia, but no one has a satisfactory explanation of why one branch of the family wound up alone in the south-west of Western Australia. (Mind you, there's many a human family in the same boat. Mine, for instance: of five Danish brothers who emigrated to Gippsland, Victoria, between 1853-1868, only one [my great-grandfather, Christian Christensen] eventually wound up in the south-west of Western Australia. Two family stories circulate accounting for this - I rate the accuracy of the nefarious version far higher.) The Quokkas, for their part, keep family history to themselves. All that can reliably be said is that they once were widespread.

No longer. Quokkas like Thylacines experienced a shrinking world and were left remaindered on two different islands, one of which proved a shelter, the other a grave. It's a common enough story on this continent, but somehow the narratives are writ larger on islands, the shadows cast longer, the meanings more distilled. The St Francis Island Potoroo is a case in point. All that is known of the species allegedly

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comes from an account by Professor Wood Jones, who visited the island and spoke to the one family that had established a small subsistence farm there:

The animals do not seem to have formed burrows, but they lived in the undergrowth, and used frequently to hop into the homestead to take bread or other eatables thrown to them from the table. They do not appear to have been nocturnal; *they do not seem to have been afraid of the human invaders of the island*. Their only offence seems to have been that they had a liking for the garden produce of the family who settled on the island (Day 229) (Italics added.)

For this “offence” they were sentenced to a truly irrevocable extinction. In the late 1880s the family introduced cats to the island in order to control the “swarms” of Potoroos. The word gives the game away. Potoroos were viewed as vermin . . . like rats . . . like Quokkas. Not so much as a specimen or bone fragment was left to bear mute testament in a dusty back drawer of some European museum. Lacking even this, the St Francis Island Potoroo remained undescribed and thus unknown to science. Oh, where were you then, St Francis, newly elected patron saint of ecology? With the force of myth, this anecdotal, possibly apocryphal, tale holds a truth - whatever its factuality. Vale Potoroos. Vale Thylacines. Vale Paradise Parrots. Vale Lesser Stick Nest Rats. Vale Big-footed Bandicoots.

It is a new century and, on Rottnest Island at least, Quokkas are still everywhere. Not so elsewhere. In May 1996 the Quokka was added to the official list of threatened species. So on some islands the animals remain, on others they are gone for good. From time to time, whole islands and whole species disappear only to reappear decades, centuries, aeons later. But it is not something to be hoped for. All across the island continent there are too many species that look likely to join all the other lost species in permanent extinction.

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**Dr Liana Joy Christensen** was fortunate enough to have many conversations with the late Emeritus Professor Bert Main during the late 1990s. This is one of the essays that resulted from those conversations.